Ontario Geological Survey

Northern Ontario
Engineering Geology Terrain Study 103

DEEP RIVER AREA

(NTS 31K/SW)

District of Nipissing and County of Renfrew

by

John F. Gartner and D.F. VanDINE

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CONTENTS

		Page
1.0	Introduction	1
2.0	Geological Setting	2
	2.1 Bedrock	2
	2.2 Quaternary	3
3.0	Engineering Terrain Units	3
	3.1 Bedrock Landforms	3
	3.1.1 Description	3
	3.1.2 Significance	4
	3.2 Glaciofluvial Landforms	4
	3.2.1 Description	4
	3.2.2 Significance	5
	3.3 Organic and Alluvial Landforms	6
	3.3.1 Description	6
	3.3.2 Significance	7
4.0	Summary of Engineering Significance	7
5.0	References	9

TABLE

1 - Summary of engineering significance 8

MAP
(accompanying report)

Map 5043 (coloured) - Northern Ontario Engineering Geology Terrain Study, Data Base Map, Deep River (NTS 31K/SW). Scale 1:100 000.

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1.0 INTRODUCTION:

This report contains an inventory of regional engineering terrain conditions in the Deep River area, District of Nipissing and County of Renfrew. The area, which covers NTS block 31K/SW, lies between Latitude 46°00'N and Ottawa River and Longitudes 77°1'W and 78°00'W. It forms part of a series of publications which provide similar terrain data for some 370 000 km^2 of northern Ontario.

The purpose of the mapping is to provide a guide for engineering and resource planning functions at a level of detail consistent with a scale of 1:100 000. The terrain information is contained on the Data Base Map (OGS Map 5043, accompanying this report).

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Interpretation of existing black and white aerial photographs, at a scale of approximately 1:38 000, was the primary method of obtaining this terrain information. The interpretation was checked with published and unpublished literature which documented previous field visits and observations. During the fall of 1977, roads in the area were traversed and observed terrain conditions recorded as further verification of the office studies. Thus, the map represents a reconnaissance overview of the engineering conditions of the terrain.

An engineering terrain legend was developed to facilitate the mapping and to provide a common information base for the entire map series. This legend is shown on the accompanying Data Base Map. Further information on the mapping techniques, legend format, and possible uses of this terrain data is available in the "Ontario Engineering Geology Terrain Study Users' Manual" (Gartner, Mollard and Roed 1980), a companion publication to this series of maps and reports.

2.0 GEOLOGICAL SETTING:

2.1 BEDROCK:

Precambrian rocks of the Grenville Structural Province underlie the Deep River map-area. These rocks have a long and complex geological history covering at least 2 500 million years (Lumbers 1971). They have been strongly metamorphosed, folded, and then intruded by igneous rocks.

The oldest and most abundant rocks of the metamorphic complex are metasediments derived largely from siliceous sandstones and siltstones. These metasediments consist of a variety of gneisses and can be found throughout most of the map-area.

Stocks, sheets, and batholiths of felsic igneous rocks were emplaced within the metasediments and were themselves metamorphosed to gneiss and migmatite.

Mineral potential of the entire map-area is rated by Springer (1978) as "least".

2.2 QUATERNARY:

Glacial ice advanced toward the south and southwest (Boissonneau 1968), depositing a discontinuous veneer of ground moraine till over the bedrock. During deglaciation, approximately 10 000 to 12 000 years ago (Harrison 1972), a number of glaciofluvial deposits were formed (Chapman 1975). Remnants of some of these deposits are shown on the Data Base Map (OGS Map 5043, accompanying this report) as kames in Head Township. Extensive outwash deposits were formed during deglaciation. Much of the land has been modified by water action, especially adjacent to the Ottawa River.

The Quaternary deposits found in the Deep River map-area are quite complex, having resulted from a variety of geological processes associated with glacial, glaciofluvial, and glaciolacustrine conditions. The user is advised to refer to Harrison (1972) and Chapman (1975) for further discussions on the glacial history.

3.0 ENGINEERING TERRAIN UNITS:

3.1 BEDROCK LANDFORMS:

3.1.1 Description:

Rock knob (RN) terrain dominates the map-area. The relative relief is moderate, with hills between 15 and 60 m in height. Complex and steep slopes are common.

Drift cover is thin (less than 1 m) and bare bedrock is common. The overburden thickens to as much as 5 m on the flanks of some of the bedrock hills.

Organic terrain commonly occurs between bedrock hills as a subordinate landform within rock knob terrain. A typical terrain unit letter code is:

$$\frac{\text{RN(tMG,pOT/R)}}{\text{Mj-D(M)}}$$

3.1.2 Significance:

RESOURCES: Portions of the rock can be used for crushed stone purposes, but detailed evaluations of suitability for aggregate use would be required.

Ground water resources within the bedrock will be limited to fractures, faults, and fissures. The occurrence of aquifers is unpredictable and the terrain has poor potential for ground water supplies.

GENERAL CONSTRUCTION: The major constraints in terms of construction are the bedrock outcrops, the occurrence of large boulders on surface, and the organic terrain that is often associated with the bedrock. This means that, in most instances, excavations will require blasting. Site-grading will be expensive and rock fills will be necessary in grading works. Foundation conditions should be excellent on the bedrock, but route alignments will require rock cut-and-fill operations.

Management of the land for any development will be complex. The steep and variable bedrock slopes, combined with the shallow overburden, make the terrain susceptible to surface erosion, especially when cleared of vegetation.

WASTE DISPOSAL: The bedrock terrain is not amenable, in its natural state, to the disposal of waste, whether it be garbage, septic tank effluent, or industrial liquids. Development of lagoons or tile fields will require grading of rock materials and, very often, importation of soil fill. Fractures in the bedrock could act as conduits for migration of effluents, and the pollution impact on surface drainage courses could be significant.

3.2 GLACIOFLUVIAL LANDFORMS:

3.2.1 Description:

Outwash (GO) deposits fill many of the river valleys within the Deep River map-area. They generally consist of sand with some gravel. Eskers (GE) and alluvial plains (AP) occur as subordinate landforms. Typical terrain unit letter codes are:

sgGO	sgGO(sgGE,pOT)	sgGO(sgAP)
Mu-M	Mu(r,p)-M	Mu(p)-M

A large sandy outwash plain extends along the south shore of the Ottawa River, from Rolphton in the north-central part of the area almost to the southeast corner. Gadd (1963) described these deposits as deltaic or valley-fill sediments dropped in the deep Ottawa Valley by glacial and post-glacial streams. Rock outcrops can be seen protruding through the sand in some areas. The terrain unit letter code is:

$$\frac{\text{sGO/R}}{\text{Mu-D}}$$

Kames (GK) and *eskers* (GE) are common in the western part of the map-area. The kames which occur along the south shore of the Ottawa River in Head Township correlate with recessional moraines identified by Chapman (1975). Typical letter codes are:

$$\frac{\text{sgGK}}{\text{Mu-D}} \qquad \frac{\text{sgGK/R}}{\text{Mun-D}}$$

In the southern part of Head Township, kames and eskers are associated in a large complex terrain unit of glaciofluvial origin. The letter code for this unit is:

$$\frac{\text{sgGK(sgGE)/R}}{\text{Mun(r)-D}}$$

3.2.2 Significance:

RESOURCES: The glaciofluvial landforms have only moderate potential for aggregate resources. Much of the material is sandy in texture and deposits with potential for crushing are not widespread. However, if sand or gravel is required within the map-area, these glaciofluvial landforms are the first areas to investigate.

Ground water supplies may exist in the deeper portions of some of these granular landforms. The outwash-delta complex on the south side of the Ottawa River may be a potential source of ground water.

GENERAL CONSTRUCTION: The materials exhibit generally good engineering characteristics due to their granular nature and good internal drainage. However, the following problems may be encountered:

1. Abrupt changes in soil texture and grain-size may be a problem during construction in kame units.

2. Wind erosion and trench stability are potential construction problems within the large outwash-delta complex around Deep River.

3. Bedrock topography beneath the glaciofluvial deposits is undulating, and bedrock may occasionally be encountered in excavations.

WASTE DISPOSAL: Because of the permeable nature of the materials and the possibility of connections between ground water and surface water, the disposal of liquid and solid wastes within glaciofluvial landforms must be approached with considerable caution. Detailed hydrogeological investigations are required to determine potential contaminant flow characteristics.

3.3 ORGANIC AND ALLUVIAL LANDFORMS:

3.3.1 Description:

Organic terrain (OT) is found throughout the map-area as a common subordinate landform within the rock knob terrain. However, only the larger deposits have been shown as separate terrain units on the Data Base Map (OGS Map 5043, accompanying this report).

The organic materials can occur in association with outwash, lake plain, alluvial plain, ground moraine, or bedrock landforms, as indicated by the letter code:

$$\frac{\text{pOT(smAP)}}{\text{Lp-W}}$$

More commonly though, the organic terrain occurs as a deeper deposit, described as:

$$\frac{\text{pOT}}{\text{Lp-W}}$$

Alluvial plains (AP) are associated with most drainage courses, but only the larger ones have been shown on the Data Base Map. An example is the alluvial plain of Wylie Creek, located southwest of the town of Deep River and depicted by the letter code:

$$\frac{\text{smAP(pOT)}}{\text{Lp-Dh(W)}}$$

3.3.2 Significance:

Both the organic terrain and the alluvial plains have very poor engineering properties and should be avoided by human activities. They are prone to flooding, can contain soft and compressible soils, and are generally unsuitable for any type of development.

4.0 SUMMARY OF ENGINEERING SIGNIFICANCE:

The preceeding section described the characteristics of the major landform types and their engineering and resource significance. Table 1 is a summary of the general engineering significance of the more common terrain units found in the area. This table is intended only as a guide to help the reader in assessing the overall significance of the map-units. Site-specific work is necessary to better define actual ground conditions, such as drainage and slope, which are not considered in the table, but which may affect the engineering significance of the various terrain units.

TABLE 1: SUMMARY OF ENGINEERING SIGNIFICANCE

		BEDROCK	GLACIOFLUVIAL		ORGANIC	
		RN(tMG,pOT/R) Mj-D(M)	sGO	sgGE	sgGK	OT
RESOURCE POTENTIAL	Sand & Gravel	Poor	Fair	Good	Good	N/A
	Ground Water	Poor	Good	Fair	Fair	Poor
LIGHT CONSTRUCTION CONDITIONS	Excavations	Blasting	Good	Good	Fair	Poor
	Foundations	Excellent	Good	Good	Good	Very Poor
	Grading	Difficult	Good	Good	Fair	Very Poor
	Material Re-Use	Rock Fill	Good	Excellent	Good	Very Poor
WASTE DISPOSAL SUITABILITY	Septic Systems	Very Poor	Good	Fair	Fair	Very Poor
	Landfill	Poor	Poor	Poor	Poor	Very Poor
	Lagoons	Very Poor	Fair	Fair	Fair	Very Poor

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Lumbers, S.B.

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